CHAPTER 14

PIPE AND STRUCTURE BACKFILL

Backfill Limits

The Trench is required to be backfilled as shown on the plans or standards sheets with "B" Borrow or Flowable Mortar. This material shall be in accordance with I.N.D.O.T. Standard specifications article 211.02 and 213.02. When Flowable Mortar is used the contractor must submit a mix design and arrange a trial batch demonstration.

Basis of Use

The basis of use for " B" Borrow is a CAPP (Certified Aggregate Producer Program) "D" Number. Always review the testing frequency manual to see what the testing requirements are. The basis of use for Flowable Mortar is the report number from the IT-652. Flowable Mortar must pass a flow test. To perform the flow test you must first fill a 3-in. diameter by 6-in. cylinder placed on a smooth level surface to the top with the flowable mortar. The cylinder should be quickly pulled straight up and the mortar spread is to be measured. The diameter of the mortar spread needs to be at least 8-in and is to be recorded on the IT-652. There is also a 14-day strength requirement for flowable mortar. The average penetration resistance needs to be at least 1,200 psi and no more than 5,000 psi. For procedures on how to perform this test see ASTM C403 and ITM 213 (See Appendix).

Backfill Methods

There are different methods of backfill required, depending on where the pipe structure is located and what is its purpose. These are shown on standard sheets BKFL.

Trench Details

The basic trench details are shown on standard sheets 715-BKFL-01 through 715-BKFL-08.

Rock Encountered

If rock is encountered during excavation for the pipe it will be necessary to remove the rock 6" below the bottom of the pipe. B-Borrow will be used as backfill to bring the pipe to its proper flowline.

Bedding Details

All of the details use B-Borrow for structure backfill or flowable mortar bedding for pipe (where pipe is bedded in earth cradle cut). On standard sheets 715-BKFL-01, -03, -05, and -07 it shows the proper limits and dimensions for backfilling with B-Borrow. On standard sheets 715-BKFL-02, -04, -06, and -08 it shows the proper limits and dimensions for backfilling with flowable mortar.

Backfill Placement

All plastic pipes that are not fabricated with hydrostatic design basis resigns, except underdrains, are to be backfilled with flowable mortar when the pipes are within 5 feet of mainline or public road approaches.

Placement of "B" Borrow as backfill material shall be in 6" loose lifts and compacted with mechanical compactors to the required density. When compacting "B" Borrow, it is necessary that the material be at its optimum moisture content to obtain the required density.

Flowable Mortar shall be uniformly placed up to the fill line as shown on the plans or standards. Before flowable mortar is placed in a trench all standing water must be removed. If this is not possible "B"-Borrow will be used up to an elevation 2 feet above the ground water.

Method 1 Backfill

When a pipe is placed under mainline pavement or its nearest point is within 5' or less of the pavement, sidewalk, curbs or gutters, Method 1 Backfill is to be used. Pipes placed under public road approaches also use Method 1 Backfill. Method 1 requires that Flowable Mortar or "B" Borrow is to be used as backfill for the width of the pavement plus 5 feet on each side of the pavement. Method 1 Backfill must also be used for a distance that is required to maintain a 2:1 slope from the above width down to the bottom of the pipe structure. Method 1 Backfill for a fill section is shown on standard 715-BKFL-01 and 715-BKFL-02. Method 1 Backfill for a cut section is shown on standard 715-BKFL-03 and 715-BKFL-04. It is important that the proper elevation of backfill material is maintained as shown in the above standards. The remaining area can be backfilled with suitable materials in layers of not more than 6", when inside the slope stake area.

Method 2 Backfill

When a pipe is placed under a commercial or private drive approaches Method 2 Backfill is to be used. Method 2 requires that "B" Borrow or Flow Mortar is to be placed at a height of half the outside diameter of the pipe structure. The length of the backfill material is the same as Method 1 Backfill. Method 2 Backfill for a cut and a fill section is shown on standard 715-BKFL-07 and 715-BKFL-08. The remaining area can be backfilled with suitable materials in

layers of not more than 6", when inside the slope stake area.

Other Backfill

Where other than special backfill material is required the material shall be:

- Of a nature to be easily compacted
- The portions around and 6" above the pipe be free of large stones

Backfilling Miscellaneous Structures

When backfilling manholes, inlets and catchbasins, if the structure is partially or completely under or its nearest point is within 5' of pavement, curb, gutter or sidewalk the excavation shall be backfilled with material that meets the requirements of section 211.02 of the standard specifications ("B" Borrow).

Backfill Outside Specified Limits

If the structure is outside the aforementioned areas, it maybe backfilled with suitable material.

Cover Limits

Always remember that the proper cover must be maintained for heavy construction equipment to cross pipe structures during construction. As previously covered in the section on excavation.

- Up to and including 18" dia or equal = 1'6" cover
- 21" up to and including 54" dia or equal = 3'0" cover
- Over 54" or equal = 4'0" cover

Ramps over Structure for Protection

If this amount of cover isn't available, then the contractor should ramp over with earth to provide the cover needed to prevent structure damage.

Limitation

Flowable Mortar must not be placed on frozen ground and must be protected from freezing until it has had time to set. Flowable Mortar can not be loaded or disturbed by

construction until an average penetration resistance for a minimum of three readings of not less than 70 psi under Portland Cement pavement or 1,200 psi under HMA pavement.

PAYMENT FOR STRUCTURAL BACKFILL

"B" Borrow Payment

When the proposal contains an item for "B" Borrow for structure backfill, it is paid for by the cubic yard based on a theoretical measurement. The "Construction Record Guide" has charts showing different cover heights and the amount of "B" Borrow per linear foot of different pipe diameters and material types. This is just for pipe backfill limits. The cost of backfilling man holes, inlets and catchbasins is included in the item cost. (See sample sheet of "B" Borrow Backfill Tables in the Appendix)

Flowable Mortar Payment

When the proposal contains an item for Flowable Mortar it is paid for by the cubic yard based on a neat line theoretical measurement. If Flowable Mortar is used as a substitute for "B" Borrow for structure backfill or if used to backfill plastic pipe fabricated with nonhydrostatic design basis resins, flowable mortar will be paid as "B" Borrow for structure backfill.

Sample Problem

A contractor placed a 30" diameter corrugated metal pipe. It measured 152 Lft. outside to outside of the inlets. The technician measured the cover in several locations and found it to average 5.8 feet. What is the theoretical pay quantity of "B" Borrow for Structural Backfill?
Using the Appendix, Table 5, factor = 1.2203 Cys/Lft.
152 Lft. x 1.2203 Cys/Lft. = 185.5 Cys.